

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of claims:

Claims 1-77 (Canceled)

78. (Previously Presented) A method for changing the temperature of a biological matter selected from the group consisting of semen, blood, blood cells, blood constituents and umbilical cord blood from an initial temperature via an intermediate temperature to a final temperature, one of the initial and final temperatures being above the freezing point of the biological matter and the other being below the freezing point, comprising:

providing the biological matter in the form of a sample having a minimal dimension in each of two mutually perpendicular cross-sections that exceeds 0.5 centimeters, and at least one of the cross-sections having an outer zone and an inner zone such that the temperature of the sample in the outer zone changes quicker than that in the inner zone; and

changing the temperature of the sample, the changing comprising

(i) changing the temperature of the sample by subjecting it to a temperature gradient from the initial temperature to the intermediate temperature until the temperature of the sample in at least one part of the outer zone equals the intermediate temperature whilst the temperature of the sample in the inner zone is different from the intermediate temperature,

- (ii) further changing the temperature of the sample by subjecting it to the intermediate temperature until the temperature of the sample in at least one cross-section is uniform and equals the intermediate temperature, and
- (iii) changing the temperature of the sample until the majority of the sample is at the final temperature.

79 – 97. (Canceled)

98. (Previously Presented) The method of claim 78, wherein the sample is subjected in step (ii) to the intermediate temperature until the temperature of the sample equals the intermediate temperature.

99. (Previously Presented) The method according to claim 78, wherein the changing of the temperature in step (i) is achieved by moving the sample through a region with a temperature gradient from the initial temperature to the intermediate temperature, and the changing of the temperature in step (iii) is achieved by moving the sample through a region with a temperature gradient from the intermediate temperature to the final temperature.

100. (Previously Presented) The method of claim 78, wherein the changing of the temperature is at least partially gradual and is achieved at least partially by the gradual movement of the sample in the direction of a temperature gradient.

101. (Previously Presented) The method of claim 100, wherein the changing of temperature in step (ii) is performed by placing the sample in a region with the intermediate temperature, the region having a length along the direction of the movement of the sample and the length is not less the length of the sample along the direction of movement.

102. (Previously Presented) The method according to claim 78, wherein the changing of the temperature in step (i) is achieved by moving the sample through a region with a temperature gradient from the initial temperature to the intermediate temperature, and the changing of the temperature in step (iii) is achieved by moving the sample through a region with a temperature gradient from the intermediate temperature to the final temperature.

103. (Previously Presented) The method according to claim 102, wherein the sample has a leading end along the direction of movement and step (i) comprises:

- (a) moving the leading end of the into a region with a temperature gradient from the initial temperature to the intermediate temperature;
- (b) pausing the movement until seeding takes place at the leading end; and
- (c) moving the sample through the region.

104. (Previously Presented) The method according to claim 103, wherein the seeding in step (b) is achieved by introduction of liquid nitrogen to the leading end of the sample.

105. (Previously Presented) The method according to claim 101, wherein step (ii) comprises:

(a) moving the sample into the region with the intermediate temperature, until substantially the whole sample is within the region;

(b) pausing the movement of the sample within the region until the temperature of the sample is substantially uniform throughout the sample and equals the intermediate temperature; and

(c) moving the sample out of the region.

106. (Previously Presented) The method according to claim 100, wherein the velocity of movement in step (i) is equal to the velocity of movement in step (iii).

107. (Previously Presented) The method according to claim 100, wherein the velocity of movement in step (i) is different from the velocity of movement in step (iii).

108. (Previously Presented) The method according to claim 78, wherein the volume of the sample exceeds 5 milliliters.

109. (Previously Presented) The method according to claim 78, wherein the volume of the sample is 12 milliliters or more.

110. (Previously Presented) The method according to claim 78, wherein the volume of the sample is 50 milliliters or more.

111. (Previously Presented) The method according to claim 78, wherein the sample comprises blood cells.

112. (Previously Presented) The method according to claim 78, wherein the sample comprises plasma.

113. (Previously Presented) The method according to any claim 78, wherein the sample comprises one or more embryos.

114. (Previously Presented) The method according to claim 78, wherein the sample comprises semen.

115. (Previously Presented) The method according to claim 78, wherein the sample is taken from humans.

116-118. (Canceled)

119. (Previously Presented) A method according to claim 78, wherein step (ii) comprises moving the sample into a region with the intermediate temperature and subjecting the sample to the intermediate temperature in the region until the temperature of the sample in each cross-section taken perpendicularly to the direction reaches the intermediate temperature by the time it is moved out of the region.

120. (Previously Presented) A method for changing the temperature of a biological matter selected from the group consisting of semen, blood, blood cells, blood constituents and umbilical cord blood from an initial temperature via an intermediate temperature to a final temperature, one of the initial and final temperatures being above the freezing point of the matter and the other being below the freezing point, comprising:

providing the biological matter in the form of a sample having a minimal dimension in each of two mutually perpendicular cross-sections exceeds 0.5 centimeters, and at least one of the cross-sections having an outer zone and an inner zone such that the temperature of the sample in the outer zone changes quicker than that in the inner zone, and

changing the temperature of the sample, the changing comprising

(i) changing the temperature of the sample by subjecting it to a temperature gradient from the initial temperature to the intermediate temperature until the temperature of the sample in at least one part of the outer zone equals the intermediate temperature whilst the temperature of the sample in the inner zone is different from the intermediate temperature, the changing is performed by placing the sample in a region with the intermediate temperature, the region having a length along the direction of the movement of the sample and the length is not less the length of the sample along the direction of movement,

(ii) further changing the temperature of the sample by subjecting it to the intermediate temperature until the temperature of the sample in at least one cross-section is uniform and equals the intermediate temperature, and

(iii) changing the temperature of the sample until the majority of the sample is at the final temperature.

121. (Previously Presented) A method for changing the temperature of a biological matter selected from the group consisting of semen, blood, blood cells, blood constituents and umbilical cord blood from an initial temperature via an intermediate temperature to a final temperature, one of the initial and final temperatures being above the freezing point of the matter and the other being below the freezing point, comprising:

providing the biological matter in the form of a sample having a minimal dimension in each of two mutually perpendicular cross-sections exceeds 0.5 centimeters, and at least one of the cross-sections having an outer zone and an inner zone such that the temperature of the sample in the outer zone changes quicker than that in the inner zone; and

changing the temperature of the sample, the changing comprising

- (i) (a) changing the temperature of the sample by subjecting it to a temperature gradient from the initial temperature to the intermediate temperature until the temperature of the sample in at least one part of the outer zone equals the intermediate temperature whilst the temperature of the sample in the inner zone is different from the intermediate temperature, the changing is achieved by moving the sample through a region with a temperature gradient from the initial temperature to the intermediate temperature, the sample has a leading end along the direction of movement,

- (b) moving the leading end of the into a region with a temperature gradient from the initial temperature to the intermediate temperature,
 - (c) pausing the movement until seeding takes place at the leading end; and moving the sample through the region,
- (ii) further changing the temperature of the sample by subjecting it to the intermediate temperature until the temperature of the sample in at least one cross-section is uniform and equals the intermediate temperature, and
- (iii) changing the temperature of the sample until the majority of the sample is at the final temperature, the changing is achieved by moving the sample through a region with a temperature gradient from the intermediate temperature to the final temperature.

122. (Previously Presented) A method for changing the temperature of a biological matter selected from the group consisting of semen, blood, blood cells, blood constituents and umbilical cord blood from an initial temperature via an intermediate temperature to a final temperature, one of the initial and final temperatures being above the freezing point of the matter and the other being below the freezing point, comprising:

providing the biological matter in the form of a sample having a minimal dimension in each of two mutually perpendicular cross-sections exceeds 0.5 centimeters, and at least one of the cross-sections having an outer zone and an inner zone such that the temperature of the sample in the outer zone changes quicker than that in the inner zone; and

changing the temperature of the sample, the changing comprising

- (i) changing the temperature of the sample by subjecting it to a temperature gradient from the initial temperature to the intermediate temperature until the temperature of the sample in at least one part of the outer zone equals the intermediate temperature whilst the temperature of the sample in the inner zone is different from the intermediate temperature,
- (ii)
 - (a) further changing the temperature of the sample by subjecting it to the intermediate temperature until the temperature of the sample in at least one cross-section is uniform and equals the intermediate temperature, the changing is performed by placing the sample in a region with the intermediate temperature, the region having a length along the direction of the movement of the sample and the length is not less the length of the sample along the direction of movement,
 - (b) moving the sample into the region with the intermediate temperature, until substantially the whole sample is within the region,
 - (c) pausing the movement of the sample within the region until the temperature of the sample is substantially uniform throughout the sample and equals the intermediate temperature,
 - (d) moving the sample out of the region, and
- (iii) changing the temperature of the sample until the majority of the sample is at the final temperature.

123. (Previously Presented) A method for changing the temperature of a biological matter selected from the group consisting of semen, blood, blood cells, blood constituents and umbilical cord blood from an initial temperature via an intermediate temperature to a final temperature, one of the initial and final temperatures being above the freezing point of the matter and the other being below the freezing point, comprising:

providing the biological matter in the form of a sample having a minimal dimension in each of two mutually perpendicular cross-sections exceeds 0.5 centimeters, and at least one of the cross-sections having an outer zone and an inner zone such that the temperature of the sample in the outer zone changes quicker than that in the inner zone; and

changing the temperature of the sample, the changing comprising

- (i) changing the temperature of the sample by subjecting it to a temperature gradient from the initial temperature to the intermediate temperature until the temperature of the sample in at least one part of the outer zone equals the intermediate temperature whilst the temperature of the sample in the inner zone is different from the intermediate temperature,
- (ii) further changing the temperature of the sample by subjecting it to the intermediate temperature until the temperature of the sample in at least one cross-section is uniform and equals the intermediate temperature, and moving the sample into a region with the intermediate temperature and subjecting the sample to the intermediate temperature in the region until the temperature of the sample in each cross-section taken perpendicularly to the direction reaches the intermediate temperature by the time it is moved out of the region, and

- (iii) changing the temperature of the sample until the majority of the sample is at the final temperature.

124. (New) The method according to claim 78, wherein a maximum dimension in each of two mutually perpendicular cross-sections 2.5 centimeters.

125. (New) The method according to claim 124, wherein the sample further comprises a freezing extender.

126. (New) The method according to claim 125, wherein the freezing extender comprises glycerol.

127. (New) A method according to claim 125, wherein the temperature of the sample is changed in an equiaxial manner.